CLAIMS

What is claimed is:

1. A comblike surfactant polymer comprising:

a) a polymeric backbone of repeating monomeric units;

b) a plurality of hydrophobic side chains comprising from about 2 to about 18 methylene groups, said plurality of hydrophobic side chains being linked to said polymeric backbone by ester linkages, secondary amine linkages, amide linkages, or combinations thereof; and

c) a plurality of hydrophilic side chains linked to said polymeric backbone by ester linkages, secondary amine linkages, amide linkages, or combinations thereof, said hydrophilic side chains selected from the group consisting of: neutral oligosaccharide side chains having a weight average molecular weight of less than 7000; charged oligosaccharide side chains having a weight average molecular weight of less than 10,000; an oligopeptide of from about 3 to 30 amino acid residues, said oligopeptide having an amino acid sequence which interacts with protein receptors on the surface of cells; and combinations thereof.

2. The surfactant polymer of claim 1 wherein said polymeric backbone is a derivatized poly (vinyl amine), or a derivatized poly (vinyl alcohol) or a derivatized polylysine

3. The surfactant polymer of claim 1 wherein said polymeric backbone is linked to said plurality of hydrophobic side chain by amide linkages;

and wherein said polymeric backbone is linked to a plurality of oligosaccharide side chains by amide linkages.

4. The surfactant polymer of claim 1 wherein said polymeric backbone is linked to said plurality of hydrophobic side chains by secondary amine linkages; and

wherein said polymeric backbone is linked to a plurality of oligopeptide side chains by secondary amine linkages.

5. The surfactant polymer of claim 1 wherein said polymeric backbone is linked to said plurality of hydrophobic side chains by secondary amine linkages;

wherein said polymeric backbone is linked to a plurality of oligopeptide side chains by secondary amine linkages;

and wherein said polymeric backbone is linked to a plurality of oligosaccharide side chains by amide linkages.

6. The surfactant polymer of claim 1 wherein said oligopeptide side chains comprise an amino acid sequence selected from the group consisting of: RGD, RRAR, RRKRR, PPRRARVT, and RPREVVPRPRP.

7. The surfactant polymer of claim 1 wherein the ratio of hydrophilic side chains to hydrophobic side chains is from about 3:1 to about 1:6.

8. The surfactant polymer of claim 1 wherein said hydrophilic side chains are selected from the group consisting of dextran, oligomaltose, heparin, dermatan sulfate, and dextran sulfate.

9. A method of reducing the thrombogenicity of a hydrophobic surface of a substrate: comprising:

a) providing a comblike surfactant polymer comprising:

i) a polymeric backbone of repeating monomeric units,

ii) a plurality of hydrophobic side chains comprising from about 2 to about 18 methylene groups, said plurality of hydrophobic side chains being linked to said polymeric backbone by ester linkages, secondary amine linkages, amide linkages; or combinations thereof and

iii) a plurality of hydrophilic side chains linked to said polymeric backbone by ester linkages, secondary amine linkages, amide linkages, or combinations thereof; said hydrophilic side chains selected from the group consisting of: neutral oligosaccharide side chains having a weight average

molecular weight of less than 7000; charged oligosaccharide side chains having a weight average molecular weight of less than 10,000, polyethylene oxide; and combinations thereof;

b) attaching the comblike surfactant polymer to the hydrophobic substrate to provide a substrate with reduced thrombogenicity.

10. The method of claim 9 wherein said surfactant polymer is attached to said surface by immersing said surface into an aqueous solution containing said surfactant polymer.

11. A method of promoting attachment of endothelial cells to the surface of a hydrophobic surface comprising:

a) providing a comblike surfactant polymer comprising:

i) a polymeric backbone of repeating monomeric units,

ii) a plurality of hydrophobic side chains comprising from about 2 to about 18 methylene groups, said plurality of hydrophobic side chains being linked to said polymeric backbone by secondary amine linkages, amide linkages; or combinations thereof and

iii) a plurality of hydrophilic side chains linked to said polymeric backbone by secondary amine linkages said hydrophilic side chains comprising an oligopeptide of from about 3 to 30 amino acid residues and having an amino acid sequence which interacts with protein receptors on the surface of endothelial cells

b) attaching the comblike surfactant polymer to the hydrophobic substrate.

12. The method of claim 11 wherein said oligopeptide side chains comprise an amino acid sequence selected from the group consisting of: RGD, RRAR, RRKRR, PPRRARVT, and PPREVVPRPR

13. A substrate having a surfactant polymer attached to a surface thereof, said surfactant polymer comprising:

a) a polymeric backbone of repeating monomeric units,

b) a plurality of hydrophobic side chains comprising from about 2 to about 18 methylene groups, said plurality of hydrophobic side chains being linked to said polymeric backbone by ester linkages, secondary amine linkages, amide linkages; or combinations thereof and

c) a plurality of hydrophilic side chains linked to said polymeric backbone by ester linkages, secondary amine linkages, amide linkages, or combinations thereof; said hydrophilic side chains selected from the group consisting of: neutral oligosaccharide side chains having a weight average molecular weight of less than 7000; charged oligosaccharide side chains having a weight average molecular weight of less than 10,000; an oligopeptide of from about 3 to 30 amino acid residues, said oligopeptide having an amino acid sequence which interacts with protein receptors on the surface of cells; and combinations thereof.

14. The substrate of claim 13 wherein said surfactant polymer comprises a plurality of oligopeptide side chains comprising an amino acid sequence selected from the group consisting of: RGD, RRAR, RRKRR, PPRRARVT, and PPREVVPRPR

15. The substrate of claim 13 wherein said surfactant polymer comprises a plurality of oligosaccharide side chains linked to said polymer backbone by amide linkages.

16. A method of preparing a surfactant polymer for changing the surface properties of a biomaterial comprising the following steps:

a) providing a polymer comprising a plurality of side groups selected from the group consisting of OH groups, COOH groups and NH_2 groups;

b) reacting said polymer with

i) an alkanoyl or an alkanal having an end for reacting with the side groups of said polymer; and

ii) a hydrophilic compound selected from the group consisting of neutral oligosaccharide chains having an end for reacting with the side groups of said polymer, charged oligosaccharide chains having an end for reacting with the side groups of said

polymer, oligopeptides having an end for reacting with the side groups of said polymer, and combinations thereof;

wherein said alkanal and said alkanoyl comprise from 2 to 18 methylene groups;

wherein said neutral oligosaccharide chains have a weight average molecular weight of less than 7000;

wherein said charged oligosaccharide chains have a weight average molecular weight of less than 10,000;

wherein said oligopeptides comprise from about 3 to 30 amino acid residues and a sequence which interact with protein receptors on the surface of endothelial cells, and

17. The method of claim 16 wherein said polymer is selected from the group consisting of poly(vinyl amine), poly(vinyl alcohol), and poly(lysine).

18. The method of claim 16 wherein said polymer is simultaneously reacted with said alkanal or said alkanoyl and said hydrophilic compound.

19. The method of claim 16 wherein the molar feed ratio of said hydrophilic compound to said alkanal or said alkanoyl is from 3:1 to 1:6.

20. The method of claim 16 further comprising the step of capping any unreacted amine groups.